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Report To The Congress

OF THE UNITED STATES

Legal And Administrative Obstacles To Extracting Other Minerals From Oil Shale

Most of the oil shale in Colorado's Piceance Creek basin is intermingled with sodium and aluminous minerals. But Federal mining laws and procedures frustrate the development of methods for extracting these valuable resources.

GAO believes that an unequivocal expression of congressional interest in optimal mineral recovery and streamlined administration of mineral development on public land is essential. The intent of present mining and leasing laws for development of low-grade and intermingled minerals is now open to more than one interpretation, which delays and renders uncertain important mineral development decisions.

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To the President of the Senate and the
Speaker of the House of Representatives

Development of multiple, intermingled minerals on public lands is hampered when disposition of each of the minerals is governed by separate legal conditions. Lack of a comprehensive legal framework for multiple-mineral development complicates administration and can prevent development of valuable mineral resources. This report uses sodium/aluminum-rich oil shale as a case in point.

We are sending copies of this report to the Director, Office of Management and Budget; the Secretary of the Interior; and the Secretary of Energy.

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COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

LEGAL AND ADMINISTRATIVE OBSTACLES TO EXTRACTING OTHER MINERALS FROM OIL SHALE

D I G E S T

Federal mineral leasing laws and resultant administrative procedures frustrate multiple extraction of intermingled minerals on public lands. These valuable minerals can be acquired under one of two mining systems:

--The General Mining Law of 1872 allows unfettered access to exploration and development of public lands valuable for minerals ("locatable" minerals);

--The Mineral Leasing Act of 1920 designates which can be mined under the specified terms of a lease issued by the Secretary of the Interior ("leasable" minerals).

Both laws assume that minerals occur in identifiable (that is, "discrete") geological deposits. There were few problems as long as discrete deposits were mined or little attention was paid to less valuable intermingled minerals. However, as more complex deposits are mined and advances in the technology of recovery increase the value of the mixed mineral deposits, it becomes more difficult to determine whether minerals should be developed under the 1872 law or the 1920 law. With extraction technology improved, and discrete deposits more scarce, the United States will be compelled to rely on more complex mineral deposits. This means that conflicts between the two mining systems will become more frequent.

AN EXAMPLE

The situation in the Piceance Creek basin in Colorado shows how intricate the problem is. The basin may be one of the world's largest mineral reserves; it contains about 27 billon

tons of dawsonite, 30 billion tons of nahcolite, and shale holding a potential 200 billion barrels of oil. Each mineral alone has enormous potential value:

--Dawsonite is a source of soda ash and alumina, which yields aluminum.

--Nahcolite is a source of soda ash, and in its natural mined state, may be an effective smokestack gas scrubber for controlling air pollution from burning coal.

--Oil shale yields shale oil.

The fact that these minerals are mixed and/or intermingled links their futures. Development of one inevitably affects development of the others.

By viewing the Piceance Creek basin as an energy resource and evaluating mineral deposits there only in terms of energy issues, the Department of the Interior has neglected the potential of the basin to supply nonfuel minerals. Ironically, Department of Energy officials have become advocates of the need to examine the nonfuel minerals associated with oil shale, believing that they may be the key to overcoming the marginal economics of shale oil development by itself.

Extracting alumina from spent oil shale not only may have energy-conservation advantages but also may offer other advantages over the conventional way of producing aluminum from bauxite.

Without knowledge of the technology and economics of developing all of the minerals in oil shale, Interior officials have made piecemeal decisions--sodium leases that prevent dawsonite as well as shale oil development and prototype oil shale leases on tracts unsuited to sodium-alumina development. (See ch. 3.)

EFFORTS TO CORRECT THIS SITUATION HAVE NOT GONE FAR ENOUGH

The Multiple Mineral Development Act of 1954 advances multiple-mineral extraction on public lands by permitting development of both leasable and locatable mineral deposits on the same tract. Though the act provided a way for a lessee and a mining claim developer to mine separate minerals on the same tract, it did not solve the problem of a single developer of intermingled locatable and leasable minerals. The concept of multiple-mineral development embodied in the 1954 law is based on the assumption that minerals occur in discrete geological deposits that can be developed individually.

The Congress recognized that mineral mixtures were not covered by the Multiple Mineral Development Act by passing the Uraniferous Lignite Act in 1955, which allowed simultaneous development of uranium (a locatable mineral) and coal (a leasable mineral) where the two were mixed together. Unfortunately, this law applies to only one particular mineral mixture.

Legislation is needed to guide future multiple-mineral development on public lands. This not only should facilitate administration and timely development of public land minerals, but also should prevent a proliferation of narrow, specific statutes which apply only to one of a host of natural mineral combinations.

RECOMMENDATIONS TO THE CONGRESS

GAO recommends that the Congress:

--Amend the Mineral Leasing Act of 1920 to allow the Department of the Interior to lease lands with deposits of more than one leasable mineral as a whole.

--Amend the General Mining Law to allow development of land containing locatable

and leasable minerals which otherwise would not be developed separately.

RECOMMENDATIONS TO THE SECRETARIES OF THE INTERIOR AND ENERGY

To help the Congress develop comprehensive legislation for multiple-mineral development, the Secretaries of the Interior and Energy jointly should consider how Western oil shale lands could be developed to allow optimum recovery of all minerals.

Within 60 days of the date of this report, they should submit to the Senate Committee on Energy and Natural Resources and the House Committee on Interior and Insular Affairs an agenda of pertinent issues, as well as an outline and timetable for a report on the technological, economic, and environmental problems associated with multiple-mineral development of oil shale. The report also should take into account how multiple-mineral oil shale development will affect development of other types of intermingled mineral deposits.

AGENCY COMMENTS

The Department of the Interior and Department of Energy agreed, in general, with the conclusions and recommendations reached in our report. Though both Departments felt that current laws could be interpreted to allow the type of multiple-mineral leasing required to develop sodium/aluminum-rich oil shale, their comments suggest that a clarification of the mining laws and regulations would be beneficial. In fact, Energy felt that the urgent need for oil shale development justified immediate action by the Congress to confirm the appropriateness of making public land available for testing multiple-mineral operations.

GAO believes that an unequivocal expression of congressional interest in optimal mineral recovery and streamlined administration of mineral development on public land is essential. The intent of present mining and leasing laws

for development of low-grade and intermingled minerals is now open to more than one interpretation, which delays and renders uncertain important mineral development decisions.

Both Interior and Energy believe that a thorough examination of alternative development plans for Western oil shale lands and the implications for other mixed mineral deposits would require more than 60 days to complete, as GAO proposed in its draft report. Given the current interest in synthetic fuel development, GAO believes that--at a minimum--the Departments should, within 60 days, provide the committees an agenda for key issues and a detailed outline for a report covering the technological, economic, and environmental problems requiring analysis, plus a timetable for report completion.

Additional Interior comments are discussed in appendix III.

Contents

		Page
DIGEST		i
CHAPTER		
1	INTRODUCTION	1
	Magnitude of the resources	1
	Order of development problems	2
	Continuation of two disposition systems	3
	Purpose and scope	3
2	STATUTORY UNCERTAINTIES	5
	Background	5
	Provisions for associated minerals	5
	Types of sodium minerals covered	6
	Oil shale leases and associated minerals	7
	Multiple-mineral development and the law	7
3	DEVELOPMENT OF MINERALS IN THE PICEANCE CREEK BASIN	9
	Lack of reliable information	9
	Oil shale withdrawals	10
	Prototype oil shale lease program	11
	Sodium preference right leases	11
	Bureau of Mines' R & D programs	14
	Private development	14
	Future development problems	15
4	CONCLUSIONS AND RECOMMENDATIONS	17
	Conclusions	17
	Recommendations to the Congress	20
	Recommendations to the Secretaries of the Interior and Energy	21
	Agency comments	21

Page

APPENDIX

I Letter from Acting Deputy Assistant Secretary of the Interior--Policy, Budget, and Administration 23

II Letter from the Director of the Office of GAO Liaison, Department of Energy 30

III GAO response to Agency Comments 32

ABBREVIATIONS

DOE	Department of Energy
GAO	General Accounting Office
R&D	Research and development

CHAPTER 1

INTRODUCTION

A forthcoming review of the Government's research-and-development (R&D) program for domestic nonbauxitic alumina resources called our attention to the potential of dawsonitic oil shale as a source of alumina as well as shale oil. There is evidence of industry interest in alumina from oil shale, but industry seems unable to evaluate the resources because they are predominantly located on public lands to which Federal policies preclude access.

Among the possible advantages of dawsonitic oil shale as a source of alumina, over alternative materials, are energy considerations. The coexistence of billions of tons of alumina with, potentially, billions of barrels of shale oil gives dawsonitic oil shale an energy advantage over alternatives such as kaolin clays. Furthermore, extracting alumina from spent oil shale may not only have energy-conservation advantages but may have other advantages over the conventional Bayer process for bauxite. Proponents claim that processing characteristics plus the vastness of the resource compensate for a low concentration of alumina in oil shale.

Dawsonitic oil shale has, until recently, been virtually excluded from federally sponsored R&D projects. Rather than enhancing its development prospects, dawsonite's coexistence with oil shale has produced administrative and legal difficulties unanticipated by existing laws and procedures.

Furthermore, sodium/aluminum-rich oil shale seems to illustrate the pitfalls of leasing complex, variable mixtures of minerals, common to hardrock (metalliferous) minerals. As discussed in our recent report, "Mining Law Reform and Balanced Resource Management" (EMD-78-93, Feb. 27, 1979), the high cost and uncertainty of information necessary to manage effectively such public resources complicate leasing hardrock minerals.

MAGNITUDE OF THE RESOURCES

Of the potential, approximate 355 billion barrels of shale oil in Colorado's Piceance Creek basin, over half (approximately 210 billion barrels) are intermingled with dawsonite, a potential source of alumina and soda

ash. One square mile in the basin could produce as much as one billion barrels of shale oil and 42 million tons of alumina. Most of the resource is on public land, managed by the Department of the Interior but withdrawn from minerals disposition.

Despite its key role in developing domestic resources, the Department of the Interior has done little to evaluate or to support development of dawsonitic oil shale as an alumina source. Furthermore, Interior agencies have ignored the potential of alumina coproduction with shale oil to help alleviate U.S. dependence on foreign sources of oil and bauxite.

ORDER OF DEVELOPMENT PROBLEMS

Traditionally, Department of the Interior officials have viewed their legislative authority as requiring public land minerals to be administered as discrete geological elements, leased one at a time. If coexistent, most minerals have been leased by separate lessees. However, if a lease tract contains coexistent leasable minerals, the lease can include rights to associated minerals--generally of less value than the primary, leased mineral--based on specific provisions of the law.

Dawsonitic oil shale is unsuited to this traditional approach. In areas where nahcolite, a sodium mineral potentially valuable as a stack gas scrubber, is mixed with dawsonitic oil shale, the entire mixture is unsuited to separate development. Therefore, simultaneous, multiple-mineral development is the most rational approach.

Since most of the oil shale in the Piceance Creek basin is mixed with dawsonite, and a large amount of this dawsonitic oil shale is mixed with nahcolite, the prototype oil shale leasing program developed by the Department of the Interior had to allow for eventual multiple-mineral development. This was done by including the possibility of sodium mineral development in the oil shale leases. Though the original two lease tracts were unsuited to the multiple-mineral approach because they have uneconomic concentrations of the sodium minerals, future tracts, nearer the heart of the deposit, would allow such an approach.

Interior's "solution" to the intermingled oil shale problem would have been adequate but for three factors:

--It was possible (and proved to be true in a number of cases) that certain tracts were more valuable for the sodium minerals than for shale oil.

--Without access to the sodium/aluminum minerals, industry could not perform R&D on mining techniques and extraction processes for those materials.

--Provisions in the Mineral Leasing Act of 1920 for leasing minerals associated with oil shale are unclear.

In other words, with the discovery that most of the oil shale of the Piceance Creek basin was intermingled with sodium and aluminous minerals, the Department of the Interior was presented with a puzzle for which there were no existing administrative or legal solutions.

CONTINUATION OF TWO DISPOSITION SYSTEMS

As discussed in our recent report, "Mining Law Reform and Balanced Resource Management" (EMD-78-93, Feb. 27, 1979), the complexity and variability of hardrock minerals argue against replacing the Mining Law of 1872 with a leasing system for all minerals on public lands. Some of the incentives of the mining law remain necessary to encourage exploration and development of hardrock minerals, and needs for environmental protection and diligent development can be best met by simply amending, rather than scrapping, the 1872 law.

With the continuation of two separate mineral disposition systems, however, it becomes important for the Congress to allow combinations of minerals to be developed. Development of complex sodium compounds like dawsonite and valuable mineral mixtures like sodium/aluminum-rich oil shale is frustrated by the disparity between the two legal systems.

PURPOSE AND SCOPE

This report is part of a continuing effort to identify opportunities for improving Federal policies which affect mineral availability. The issues discussed supplement our earlier report on mining law reform.

To arrive at our conclusions and recommendations, we reviewed pertinent documents, studies, hearing records, and professional journals. We also interviewed representatives of the private and public sectors regarding the issues.

CHAPTER 2

STATUTORY UNCERTAINTIES

Concurrent development of all the minerals found in the oil shale of the Piceance Creek basin is hampered by a number of legal conflicts and deficiencies. These conflicts and deficiencies stem from the fact that the concept of simultaneous, multiple-mineral development by a single developer is, not addressed in the Mineral Leasing Act of 1920.

To complicate the matter further, the legal status of dawsonite and other complex mineral compounds containing sodium is unclear under present laws. The Secretary of the Interior's administrative classification of dawsonite as a sodium mineral, subject to the Mineral Leasing Act of 1920, and the inclusion of rights to sodium minerals in oil shale leases are debatable.

BACKGROUND

The General Mining Law of 1872 established a claim-patent system, commonly called the location system, for disposition of minerals on public lands. This law was later modified when the Congress enacted the Mineral Leasing Act of 1920, designating certain minerals to be developed under terms of a lease rather than a claim.

To accommodate orderly development of the energy resources on public lands, the Mineral Leasing Act of 1920 established minimum leasing terms for oil, gas, coal, and oil shale. Certain compounds of sodium and phosphates were also included, and later, other specific minerals were added. Unless a mineral is clearly designated as subject to the leasing act, it comes under the Mining Law as a locatable mineral.

PROVISIONS FOR ASSOCIATED MINERALS

The Mineral Leasing Act of 1920 does not address the disposition of complex mineral mixtures. Such mixtures can contain minerals, leasable separately under different provisions of the law which are efficiently minable as a single entity with multiple products. Although, through royalty provisions for "related products", the act implies allowances for some combinations of minerals, the overall questions of what conditions and circumstances govern multiple-mineral leasing remain unanswered. The ambiguity

of such language, coupled with the geological commonness of sodium lease congressional intentions uncertain for many complex and valuable mineral compounds.

Some mineral compounds, particularly sodium minerals, can contain both locatable and leasable elements. Dawsonite for example, is neither clearly locatable as an aluminous raw material under provisions of the Mining Law of 1872, nor is it clearly leasable as a sodium carbonate under provisions of the Mineral Leasing Act of 1920.

TYPES OF SODIUM MINERALS COVERED

The sodium compounds mentioned in the leasing act (carbonates, silicates, chlorides, sulfates, borates, and nitrates) were generally referred to as "fertilizer minerals," along with phosphates, when the law was written. Sodium compounds not specifically mentioned (and not used as fertilizers), such as cryolite (sodium aluminum fluorite), continued to be acquired by claim-patent procedures.

To acquire sodium compounds on public lands, potential development must first get a prospecting permit for sodium minerals and then must discover deposits of leasable sodium compounds valuable enough to make the land encompassed by the prospecting permit "chiefly valuable" for the sodium minerals. This "chiefly valuable" provision of the law can obviously present a problem when the values among intermixed minerals like sodium/aluminum-rich oil shale fluctuate or are undetermined due to the newness of technological development and the lack of commercial experience.

Besides dawsonite, which contains sodium carbonate but is chiefly valuable for aluminum, other sodium compound minerals are subject to the leasable versus locatable debate. For example, bentonite, an alumino silicate with either sodium, potassium, calcium, or magnesium elements, has been the subject of some confusion over the appropriate disposition procedure for potential developers. Zeolite and alunite are additional examples.

To resolve questions over the locatability versus leasability of such minerals, the Department of the Interior has developed complicated and uncertain tests for mineral compounds to determine the applicable disposition system. Questions of which elements, in what proportions, with what chemical properties, and for what ends the minerals are to be developed, provide a framework for administrative decisions.

OIL SHALE LEASES AND ASSOCIATED MINERALS

The mineral leasing act contains no specific provisions for leasing sodium minerals with an oil shale lease. At the time the leasing act was passed, the complexity and variability of the deep-lying shale was unknown. The fact that most oil shale on public lands was intermingled with potentially valuable sodium and aluminous minerals could not possibly have been foreseen and was not addressed by the Congress.

The Department of the Interior believes that the Mineral Leasing Act, as amended, provides authority for multiple-mineral oil shale leasing. We feel, however, that the provisions of the Mineral Leasing Act are inadequate for multiple-mineral oil shale leasing for the following reasons:

--At the time of the Mineral Leasing Act was passed, the existence of sodium minerals intermingled with oil shale was unknown. The original Act provided a separate regime for leasing sodium mineral lands.

--Some of the minerals in the oil shale may be locatable, e.g., dawsonite.

--The Leasing Act did not address the disposition of complex mineral mixtures.

MULTIPLE-MINERAL DEVELOPMENT AND THE LAW

Congressional interest in fostering multiple-mineral development on public land is demonstrated by the Multiple Mineral Development Act of 1954. However, this act is primarily useful when applied to discrete, stratified deposits of locatable and leasable minerals. It stops short of solving the more perplexing problems of intermingled minerals.

The Multiple Mineral Development Act, passed primarily in response to the need to encourage exploration for and allow development of uranium, required that leasing act minerals on mining claims be reserved for the U.S. Government. Also, to allow for concurrent development of coexisting leasable and locatable minerals, the act provides that each kind of mining (location and lease) be conducted "so far as reasonably practicable" in a way which would allow multiple-mineral development. It provides for compensation when mineral values are lost or damaged unnecessarily.

What the multiple-mineral development act does not do, nor any other Federal mining law, is to establish a scheme for concurrent multiple-mineral development of minerals which cannot be extracted separately. This absence of a complete framework for (1) fostering concurrent multiple-mineral development where possible; (2) prescribing an order of development which will maximally conserve valuable mineral resources; and (3) generally resolving conflicts between operation of the location and leasing systems is likely to become more troublesome in the future. It is axiomatic that the demand for materials will continue to grow and that currently marginal and complex mineral deposits will be needed to satisfy these needs.

In the mid-1950s, the Congress passed the Uraniferous Lignite Act to allow simultaneous development of coal and uranium. This law was necessary to allow a uranium claimant, subject to the Mining Law of 1872, to develop uranium intermingled in lignite coal, a leasable mineral. Before passage of this law, the conflicts preventing the uranium development were indicative of the obstacles which this report addresses.

CHAPTER 3

DEVELOPMENT OF MINERALS

IN THE PICEANCE CREEK BASIN

As a publicly owned resource, the Piceance Creek basin is particularly dependent on Federal management, and a number of Federal policies and programs affect development of the minerals there. Mineral disposition policies and development programs sponsored by Federal agencies for each of the minerals in the deposit can promote or restrict, simplify or complicate, development of each of the other minerals.

Chief among the relevant Federal programs is the Department of the Interior's prototype oil shale lease program. This program is supplemented by the Department's sodium leasing policy for oil shale lands. Also, Bureau of Mines' R&D metallurgy and mining programs for dawsonite as a source of alumina and for mining deep, sodium/aluminum-rich oil shale have potential to supply technological and economic information critical to leasing decisions.

While officials within the Department of Energy (DOE) are eager to test the viability of the multiple-mineral approach to oil shale development, no formal plans or proposals to do so exist at present. Limited access to sodium/aluminum-rich oil shale restricts the type and size of effort that would be possible without revising current oil shale disposition policy.

LACK OF RELIABLE INFORMATION

Opinions differ as to the viability of multiple-mineral oil shale development. Proponents point to (1) the value of the resource in question; (2) the joint cost advantages of the multiple-mineral concept; and (3) the potential benefit of tapping domestic resources of both a liquid fuel and aluminous raw material, not to mention the possible role of nahcolite in coal-burning air pollution control. Detractors claim that the concept is economically questionable and of no immediate necessity.

The essential problem in realistically examining the merits of multiple-mineral development in the Piceance Creek basin is the lack of public information on the

technology and economics of mining, processing, and marketing. The only possible, reliable statement regarding the issues is that the Federal Government has inadequate information to make wise decisions regarding disposition of the minerals in the Piceance Creek basin. Federal officials making decisions affecting the deposits are relying on limited data provided by private industry plus dated, laboratory-scale information developed by the Bureau of Mines.

The primary cause of the information vacuum is lack of access to adequate amounts of the minerals in question to pursue the necessary R&D. Most of the resource is on public land, withdrawn from mineral exploration since the sodium minerals were discovered and a rash of dawsonite/alumina claims were made in the mid-1960s.

OIL SHALE WITHDRAWALS

Oil shale has long been subject to on-again-off-again development. Recognized as a potentially valuable source of oil in 1920, it was included in the Mineral Leasing Act of 1920. This act gave the Secretary of the Interior broad discretionary control of the resource. In 1930, President Herbert Hoover withdrew oil shale lands from leasing, but in 1935, the withdrawal order was modified to allow prospecting and noncompetitive leasing for sodium resources on the affected lands.

This modification was reversed in 1967, when the Secretary of the Interior again withdrew oil shale lands from metalliferous mineral claims. A flurry of claims for aluminum and sodium preference right lease applications caused this withdrawal, which also restricted future sodium leasing to areas "* * * where the Secretary finds that development of the sodium deposits would not affect in any significant way the oil shale values of the lands."

The Department of the Interior fought issuing four noncompetitive sodium leases it ultimately had to grant in 1971, after the U.S. Geological Survey reported that the tracts were chiefly valuable for sodium minerals. To make these leases compatible with emerging policy on leasing oil shale, the sodium leases contained severe restrictions on the lessees' rights to oil shale.

PROTOTYPE OIL SHALE LEASE PROGRAM

After an unsuccessful test lease program for oil shale in 1968, the Secretary of the Interior proposed a prototype oil shale lease program in 1971. Oil shale lease tracts were nominated for inclusion in the program, evaluated, and, eventually, six proposed tracts were selected for leasing. Bids were received for four of the six tracts, two in Colorado and two in Utah, and leases were issued in 1974.

Of these four original lease tracts, only the two in Colorado's Piceance Creek basin remain in the program. The State of Utah successfully sued the Federal Government for ownership of the two Utah tracts.

No additional oil shale leasing beyond the prototype program is contemplated until it has been fully evaluated and an environmental impact statement is prepared on further leasing.

Though the two remaining oil shale lease tracts were evaluated by the original lessees, both were found to have uneconomic concentrations of sodium and aluminous minerals to warrant multiple-mineral development. At present, both tracts are proposed for development with modified in situ recovery of shale oil alone. (See map on p. 13.)

The Department of the Interior was criticized for not including a sodium/aluminum-rich oil shale tract in the prototype oil shale lease program. It responded, in the environmental impact statement for the program, that such a tract was not included because "* * * the importance of such mineral products to overall economic viability is uncertain at this time." This statement disregards the fact that a primary purpose of the program was to allow private industry to settle some of the uncertainties facing commercial shale oil development. Uncertainties regarding the economic benefit of coproduction of alumina and shale oil will remain until the Bureau of Land Management offers an appropriate lease tract or until Superior Oil Company, the only private company owning suitable land, operates a commercial demonstration plant for a multi-minerals process.

SODIUM PREFERENCE RIGHT LEASES

The potential value of Piceance Creek basin oil shale as a source of oil had been recognized for

decades when, in the mid-1960s, large resources of sodium/aluminum minerals were found intermingled with deep-lying oil shale. The presence of dawsonite, a potential source of aluminum in the oil shale, sparked a flurry of mineral claims, causing the Department of the Interior to withdraw all oil shale lands from mineral entry in early 1967.

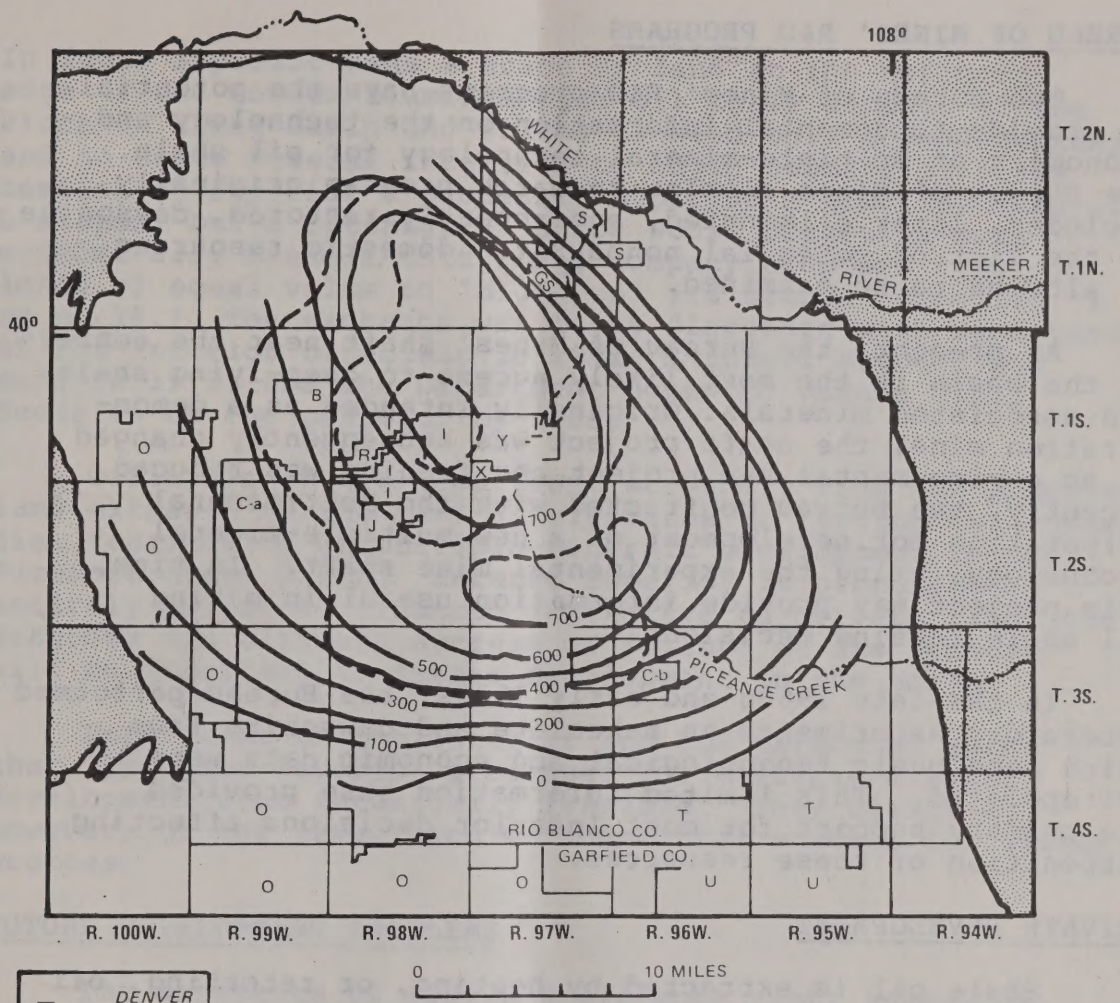
In 1964, 11 sodium prospecting permits were issued for the Colorado Piceance Creek basin, and in 1966, 8 of the permittees applied for preference right leases based on discovery of valuable deposits of nahcolite and dawsonite. Because it was unclear whether dawsonite was locatable or leasable, the sodium lease applicants also staked metalliferous mining claims on the same tracts. (These lease applications and additional mining claims led the Secretary to virtually eliminate exploration on oil shale lands, as previously mentioned.)

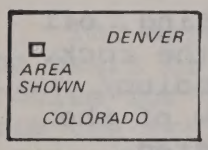
After the Department of the Interior ruled that dawsonite was leasable, as a sodium carbonate mineral, four of the sodium lease applicants agreed to forego pursuit of their claims for dawsonite in order to receive non-competitive sodium leases. Some dawsonite/alumina claims are still outstanding, however, and ultimately their validity can be determined only by litigation.

In 1971, after protracted administrative delay and analysis, the Department of the Interior issued four sodium preference right leases for tracts encompassing some of the richest oil shale deposits in the Piceance Creek basin. These leases contain severe restrictions on the amount and type of oil shale which can be disturbed by the lessees. These restrictions amount to an exclusion of dawsonitic alumina extraction which depends on preliminary extraction of shale oil. In effect, the sodium leases are valid only for discrete beds of nahcolite. (See map on p. 13.)

Four of the original eight sodium lease applications are still pending. Geological Survey personnel believe that three of these applications are valid and the tracts sought were chiefly valuable for sodium/aluminum minerals when the applications were originally made. Currently, the tracts are chiefly valuable for shale oil; however, if nahcolite is successfully tested as a commercial stack gas scrubber, the sodium values for the tracts may again exceed shale oil values, making it possible for the Department of the Interior to issue sodium leases.

MINERAL LEASES AND NAHCOLITE & DAWSONITE FORMATION
PICEANCE CREEK BASIN, COLORADO





LOCATION MAP

CODE:

S	SUPERIOR OIL COMPANY LAND
SG	SUPERIOR LAND PROPOSED FOR TRANSFER TO U.S.
GS	U.S. LAND PROPOSED FOR TRANSFER TO SUPERIOR
I	INDUSTRIAL RESOURCES SALINE MINERAL LEASE
Y	YANKEE GULCH VENTURE SALINE MINERAL LEASE
R	ROCK SCHOOL CORP SALINE MINERAL LEASE
J	JUHAN AND NICHOLS SALINE MINERAL LEASE
C–a, C–b	FEDERAL OIL SHALE LEASE TRACTS
T, U, O.	TOSCO, UNION, AND OTHER OIL SHALE LEASES
B	AREA WITHDRAWN BY AEC/USBM
X	BUREAU OF MINES EXPERIMENTAL MINE SHAFT
– – –	NAHCOLITE
———	DAWSONITE

(MAP EXTRACTED FROM DAWSONITE AND NAHCOLITE SURVEY, VOL. 1, CLIFFORD FARRIS AND CHARLES MAINS, COLORADO SCHOOL OF MINES RESEARCH INSTITUTE)

BUREAU OF MINES' R&D PROGRAMS

Two Bureau of Mines' R&D programs have the potential to provide fundamental information on the technology and economics of multiple-mineral technology for oil shale. The Bureau of Mines alumina research program originally included, later eliminated, and recently restored, dawsonite to the list of potential nonbauxitic domestic resources of alumina to be examined.

At present, the Bureau of Mines' shaft near the center of the basin is the most likely access to deep-lying shale and associated minerals. Originally intended as a demonstration mine, the shaft project was subsequently changed to an environmental R&D project and funding was reduced. Recently, the Bureau contracted with the Multimineral Corporation for development of a new multiple-mineral technology, using the experimental mine shaft. In time, this project may provide information useful in making oil shale leasing decisions.

In the late 1960s and early 1970s, the Bureau performed laboratory experiments on nahcolite and dawsonite from which some basic technological and economic data were extrapolated. This limited information base provides the primary support for most Interior decisions affecting disposition of these resources.

PRIVATE DEVELOPMENT

Shale oil is extracted by heating, or retorting, oil shale until the oil liquefies and separates from the rock. Too much heat renders the aluminous material in sodium/aluminum-rich oil shale unextractable. Only a few of the retorting processes developed by companies interested in shale oil use low enough or controlled heat to be adaptable to a multiple-mineral approach.

TOSCO, formerly The Oil Shale Corporation, has patented a process claimed to be suitable for multiple-mineral production from oil shale and claims to need only access to oil shale that is rich in other minerals to test the commercial feasibility of the process. Also, Shell Oil Company has patented a modified in situ proces which controls heat enough to protect the aluminum intermingled with oil shale.

Superior Oil Company has a development plan for an integrated, multiple-mineral process to produce nahcolite, dawsonitic alumina, soda ash, and shale oil from oil shale.

In fact, Superior owns a tract of land at the northern edge of the sodium/aluminum-rich oil shale deposit of the Piceance Creek basin and claims to need only a land exchange and no other Federal incentive to begin commercial-scale testing of Superior's process. Superior's tract of land is L-shaped, but a rectangular shape would present a more economically minable unit. The company proposes trading lands of equal value to "block up" its tract. (See fig. 1 on p. 16.) The exchange was first discussed with Department of the Interior officials in 1971; a formal request was made in 1973; and the Department hopes to make a final decision on the proposal by 1980.

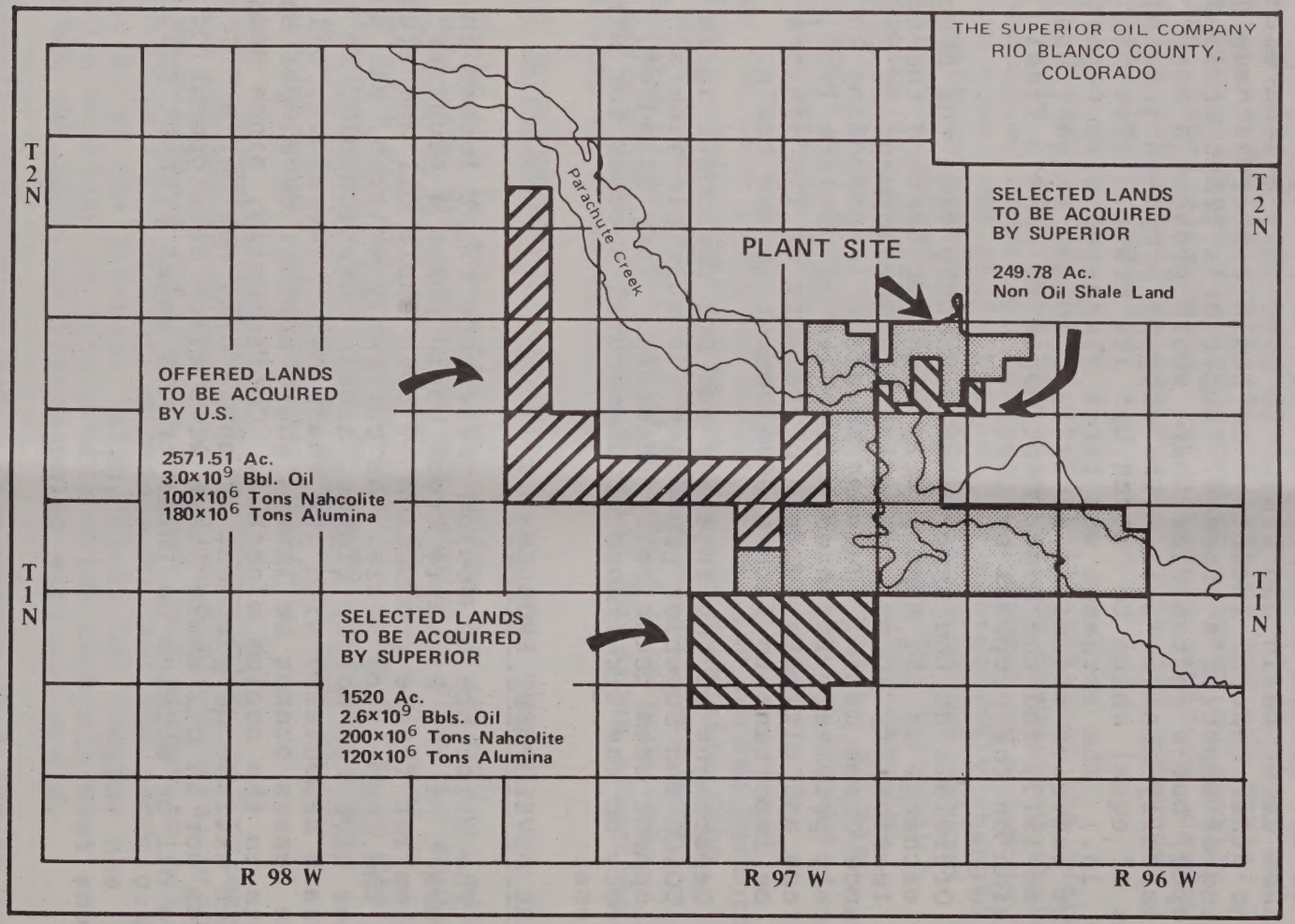
Officials at the Department currently view the proposed land exchange as the most likely means of testing the commercial feasibility of multiple-minerals development in the Piceance Creek basin. Because Superior is proposing an entirely privately financed initiative on private land, the progress and ultimate success or failure of its venture will be important to future development in the basin.

Department of the Interior and DOE personnel agree that TOSCO and Superior processes for multiple-mineral development seem technically feasible. They disagree, however, on the likelihood of commercial success for either process.

FUTURE DEVELOPMENT PROBLEMS

The existence of sodium preference right leases in the heart of the Piceance Creek basin poses a peculiar problem for future production of both shale oil and alumina from the deep-lying shale. As currently written, oil shale leases give the holder rights, albeit questionable, to the minerals associated with the shale oil. Therefore, oil shale leases cannot be issued where another developer has rights to the sodium minerals. Consequently, since sodium leases exclude development of shale oil, neither a sodium nor an oil shale lease will allow development of shale oil or alumina on these tracts under present policies.

FIGURE 1-COMPONENTS OF PROPOSED LAND EXCHANGE BETWEEN SUPERIOR OIL COMPANY AND THE FEDERAL GOVERNMENT



CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

Current mineral leasing laws and administrative procedures frustrate multiple-mineral development of complex, intermingled minerals on public lands. Statutory ambiguity plus procedural problems have prevented basic evaluation of the nonfuel potential of sodium/aluminum-rich oil shale. The Department of the Interior has formulated oil shale disposition policies which jeopardize future development of sodium/ aluminum-rich oil shale.

CONCLUSIONS

The Mineral Leasing Act of 1920 does not address the disposition of complex mineral mixtures. Such mixtures can contain minerals leasable separately under different provisions of the law which are most efficiently minable as a single entity with multiple products. Although the act implies allowances for some combinations of minerals, the overall questions of what conditions and circumstances govern multiple-mineral leasing remain unanswered.

Some mineral compounds, particularly sodium minerals, can contain both locatable and leasable elements. Dawsonite, for example, is neither clearly locatable as an aluminous raw material under provisions of the Mining Law of 1872, nor is it clearly leasable as a sodium carbonate under provisions of the Mineral Leasing Act of 1920.

Future development of sodium/aluminum-rich oil shale is hampered by (1) the legally unresolved question of dawsonite's status--is it leasable or locatable?--and the fact that, if it is locatable, legislation is needed to allow disposition; (2) the fact that the sodium preference right leases in the heart of the Piceance Creek basin prevent development of dawsonitic oil shale by the sodium developers; and (3) the questionable inclusion of rights to sodium minerals in oil shale leases. Since neither a sodium nor an oil shale lease offers an indisputable means of disposition, future development of these intermingled minerals, particularly on the sodium lease tractts, is problematic.

With the modernization of the location system as recommended in our earlier report, "Mining Law Reform and Balanced Resource Management" (EMD-78-93, Feb. 27, 1979), the differences between the location and lease systems should become more administrative than financial. When

fair-market-value return to the public guides disposition of publicly owned minerals, the choice of which system or systems to use will be of concern only in facilitating administration of development.

At present, development of mixtures of minerals, each subject to separate provisions of the mining laws, is hampered by the lack of harmony between the principles of the location and lease laws. This disparity necessitates time-consuming, often inconclusive, resolution of which system to assign a particular mineral to and in what combinations to allow mineral extraction from a particular deposit.

Furthermore, the underlying assumption of both mining laws--that minerals occur in discrete geological deposits--has contributed to the inability of the Department of the Interior to formulate a coherent disposition policy for all of the minerals in the Piceance Creek basin.

By viewing the Piceance Creek basin as an energy resource and evaluating disposition policy there only in terms of energy issues, Interior has neglected the potential of the resource to supply nonfuel minerals. Ironically, Department of Energy officials have become advocates of the need to examine the nonfuel minerals associated with oil shale, believing that they may be the key to overcoming the marginal economics of shale oil development alone.

Lacking fundamental knowledge on the technology and economics of developing all of the oil shale minerals, Interior officials have made piecemeal disposition decisions. At present, Interior has (1) sodium leases that prevent dawsonite as well as shale oil development and (2) prototype oil shale leases on tracts unsuited to sodium-alumina development in effect in the Piceance Creek basin.

Federally sponsored programs, such as the Bureau of Mines alumina research program and the prototype oil shale lease program, have the potential but have not provided basic technological and economic data for disposition decisions. When such programs exclude alternative raw materials or processes in favor of a single resource or process, equally desirable or superior processes and materials may remain undeveloped. Also, any conclusion reached about the single process and material remains tentative.

Excluding certain salable materials, such as common varieties of stone and sand, the valuable minerals in

public lands can be acquired under terms of one of two mining systems. The General Mining Law of 1872, as amended, allows unfettered access to, development and eventual patent of a tract of public land valuable for a hardrock mineral. The Mineral Leasing Act of 1920, as amended, designates particular minerals which can be developed only under the specified terms of a lease issued at the discretion of the Secretary of the Interior.

Both of these laws more or less assume that minerals occur in discrete geological deposits, and, so long as discrete deposits were mined (or little attention was paid to the less valuable intermingled minerals), few problems resulted. However, as more complex deposits are now being mined, and the intermingled minerals are becoming more valuable due to advances in recovery technology, it is becoming more difficult to classify deposits as to type and value than in the past. As technology improves and discrete deposits become more scarce, the United States will need to rely on more complex mineral deposits, and the frequency of conflicts between the two mining law systems will certainly increase.

Specifically, conflicts will arise when public lands contain a mixture of valuable minerals, each subject to separate legal conditions for development. These conflicts occur on lands under one of the following three sets of circumstances:

--Lands containing a mixture of leasable minerals, each subject to separate provisions of the Minerals Leasing Act of 1920.

--Unappropriated lands 1/ containing intermingled locatable and leasable minerals, economic development of which depends on simultaneous extraction.

--Lands on which a mineral claimant has existing rights under the 1872 law but which also contain leasable minerals.

The Multiple Mineral Development Act of 1954 advances the principle of multiple-mineral development on public lands. This law permits the multiple development of both leasable and locatable mineral deposits on the same tract

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1/Unappropriated lands are lands clear of mineral claims.

of land. It requires claims for locatable minerals to contain a reservation to the United States of the leasable minerals upon going to patent, if the lands are included in an exploration application, permit, or lease or were known to be valuable for a leasable mineral.

Though the Multiple Mineral Development Act provided a means of allowing a lessee and mining claim developer to mine separate minerals on the same tract, it did not solve the problem of a single developer of both locatable and leasable minerals. Essentially, the concept of multiple-mineral development advanced by the Multiple Mineral Development Act continued to make the assumption that minerals occurred in discrete geological deposits, sometimes stratified, which could be developed separately.

The Congress recognized that mineral mixtures were not covered by the Multiple Mineral Development Act by passing the Uraniferous Lignite Act in 1955, which allowed simultaneous development of uranium (a locatable mineral) and coal (a leasable mineral) when the two were mixed together. Unfortunately, this law applies only to one particular mineral mixture.

We believe that there is a strong need for legislation to guide future multiple-mineral development on public lands. Such legislation should not only facilitate administration and timely development of public land minerals but should also avoid a proliferation of narrow, specific statutes applicable to a host of natural mineral combinations, such occurred in the uranium/lignite situation.

RECOMMENDATIONS TO THE CONGRESS

We recommend that the Congress:

--Amend the Mineral Leasing Act of 1920 to allow the Department of the Interior to lease lands as a whole which contain mineral deposits of more than one leasable mineral.

--Amend the General Mining Law to allow concurrent development on lands containing locatable and leasable minerals which would not otherwise be developed separately.

RECOMMENDATIONS TO THE SECRETARIES OF THE INTERIOR AND ENERGY

In order to assist the Congress in the development of comprehensive legislation for multiple-mineral development, we recommend that the Secretaries of the Interior and Energy jointly consider how the Western oil shale lands could be developed to allow optimum recovery of all the minerals contained in the deposits. They should submit, within 60 days of the date of this report, to the Senate Committee on Energy and Natural Resources and the House Committee on Interior and Insular Affairs an agenda of pertinent issues, as well as an outline and timetable for a report on the technological economic, and environmental problems associated with multiple-mineral development of oil shale. The report should also indicate implications in multiple-mineral oil shale development for rational development of other types of intermingled mineral deposits.

AGENCY COMMENTS

The Department of the Interior and Department of Energy agreed in general with the conclusions and recommendations reached in our report. Though both Departments felt that current laws could be interpreted to allow the type of multiple-mineral leasing required to develop sodium/aluminum-rich oil shale, their comments suggest that a clarification of the mining laws and regulations would be beneficial. In fact, Energy felt that the urgency of the need of oil shale development justifies immediate action by the Congress to confirm the appropriateness of making public land available for testing multiple-mineral operations. (See p. 7 for discussion of legal issues.)

DOE believes that the Multiple Mineral Development Act authorizes disposition of sodium/aluminum-rich oil shale. However, we believe the unresolved status of dawsonite prevents proceeding under DOE's assumption. If the alumina in dawsonite is locatable, the fact that it (dawsonite) is intermingled with leasable minerals puts dawsonitic oil shale in the same position as uraniferous lignite which required a separate piece of legislation to solve the impasse.

We believe that an unequovical expression of congressional interest in optimal mineral recovery and streamlined administration of mineral development on public land is essential. The intent of present mining and leasing laws for development of low-grade and intermingled minerals is

now open to more than one interpretation, which only serves to delay and render uncertain important mineral development decisions.

As Interior commented in reviewing the draft of this report, "The most logical way to develop a specific tract is to issue a combined lease to a single lessee. This maximizes mineral recovery and reduces potential for environmental disturbances." We believe that such an end has not been pursued in the Piceance Creek basin, in significant part due to the lack of a clear statutory framework for doing so.

Both Interior and Energy felt that a thorough examination of the alternative development plans for Western oil shale lands and the implications for other mixed mineral deposits would require more than the 60 days originally recommended. We believe that, given the current interest in synthetic fuel development, the Departments should, at a minimum, within 60 days of the date of this report, provide the Senate Committee on Energy and Natural Resources and the House Committee on Interior and Insular Affairs an agenda of key issues and a detailed outline for a report covering the technological, economic, and environmental problems requiring analysis, plus a timetable for report completion.

Additional detailed Interior comments are discussed in appendix III.

APPENDIX I

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

JUL 3 1979

Mr. J. Dexter Peach
Director, Energy and Minerals Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

We appreciate the opportunity to review the GAO draft report entitled, "Aluminum in Oil Shale: Obstacles to Multiple Mineral Development on Public Lands" (EMD, Released 5/4/79).

While we agree in principle with the recommendation made on page 20 *, we take issue with the conclusion reached on page 16, that "the Department of the Interior has formulated oil shale disposition policy which jeopardizes future development of sodium/aluminum-rich oil shale." This conclusion is drawn from statements made on page 10 -- that the Department was criticized for not including a sodium/aluminum-rich oil shale tract in the prototype program and in response stated in the environmental impact statement ". . . the importance of such mineral products to overall economic viability is uncertain at this time." The report continues: "This statement disregards the fact that a primary purpose of the program was to allow private industry to settle some of the uncertainties facing commercial shale oil development."

The prototype program was designed to determine the economic and environmental viability of oil shale production. In announcing the decision in November 1973 to implement the oil shale prototype program, the Secretary of the Interior listed four program goals:

1. To provide a new source of energy to the Nation by stimulating the development of commercial oil shale technology by private industry;

2. To insure the environmental integrity of the affected areas and at the same time develop a full range of environmental safeguards and restoration techniques that will be incorporated into the planning of a mature oil shale industry, should one develop;

3. To permit an equitable return to all parties in the development of this public resource; and

* Page numbers have been changed to correspond to the final report.

4. To develop management expertise in the leasing and supervision of oil shale development in order to provide the basis for future administrative procedures.

The references in the report that development of dawsonite or nahcolite is prevented by administrative or Departmental leasing policy should be deleted or put in the proper context. Departmental consideration of the Superior Oil Shale exchange and the utilization of the Bureau of Mines experimental oil shale shaft by Multimineral Development Corporation are designed to further simultaneous development of these minerals.

It is only partially true to say that Federal lease tracts C-a and C-b are unsuited to the multiple-mineral approach, because they have uneconomic concentrations of the sodium minerals (p.10). The tracts contain dawsonite in as thick a sequence of rock as the Superior property, but they do not contain economic concentrations of nahcolite.

The lack of public information on technology and economics of mining, processing, and marketing (p. 9) and lack of access to adequate amounts of minerals, in question, to pursue the necessary research and development (p. 9) is about to be rectified. Multimineral Development Corporation's project from the Bureau of Mines experimental shaft will result in the evaluation of mining the deep nahcolite, dawsonite and oil-rich shale. In addition, it will produce dawsonite for metallurgical studies of alumina extraction, and nahcolite for commercial scale tests of the SO_2 scrubbing potential in stacks of a coal-fired power plant and an oil refinery. Results of this research will be made public.

It is not correct to say that uncertainties regarding the economic benefit of coproduction of alumina and shale oil will remain until the Bureau of Land Management offers a suitable lease tract or until Superior Oil Company, the only private company owning suitable land, operates a planned commercial demonstration plant for multiminerals process (p. 10). Admittedly, Superior Oil Company is one of only two companies interested in the multimineral approach; however, Superior is not the only company with multimineral land ownership. More than 15 square miles of land in the mineral-rich part of the Piceance Creek Basin is in private ownership including approximately three square miles owned by Bell Petroleum, and five square miles owned by Exxon. These land holdings are in scattered, long, narrow strips, along the creek bottoms, and would require a land exchange with the Federal Government, similar to that requested by Superior Oil Company, to assemble a minable block.

It is not correct to say (p. 13) that the Bureau of Mines eliminated dawsonite from consideration as a potential alumina resource. The Bureau stated at the beginning of its miniplant project that dawsonite was placed last on the list because time was needed to allow development

of the oil shale deposits, and to obtain a large sample, but it was never thereafter rejected from consideration. More recently, the priority for dawsonite research was raised, and preliminary laboratory testing is scheduled for the near future on 100 tons of material taken from the Bureau's experimental mine shaft.

While we agree in principle with the recommendation that consideration be given to encourage optimum recovery of all minerals contained in western oil shale deposits, several factors must be kept in mind:

1. Research has not yet proved the economic value of the dawsonite and nahcolite, including the value of these minerals as compared with other minerals or, in the case of nahcolite, with other methods of desulphurization.

2. Even if their economic value is proved, the economics of mining, processing, transportation and marketing still are unknown.

3. The environmental consequences of mining and processing these minerals still must be learned.

It is hoped that some of these answers will begin to come from the two projects in which the Department of the Interior now is involved -- the Multimineral Development Corporation research from the Bureau of Mines experimental shaft and the proposed Superior Oil Shale land exchange.

In any event, we suggest that if the recommended study is undertaken it be broadened to consider multiple use policies and objectives and the simplest legal and regulatory means to meet those policies and objectives.

For such a complex problem, a comprehensive and flexible approach might be best. A study of western oil shale lands with ancillary consideration of the implications for other multimineral deposits could be the first step in such a comprehensive examination. We also feel it would be unwise to constrain the formulation of such recommendations to a 60-day time frame, because of the complexity of the problem.

In connection with such a study, the following three points should be kept in mind:

1. Page 6 of the report states that "there is no provision in the Mineral Leasing Act to lease minerals other than oil shale with an oil shale lease." This is incorrect. That part of the Mineral Leasing Act dealing with oil shale, native asphalt, solid and semi-solid bitumin, etc.,

APPENDIX I

(Sec. 30, U.S. Code 241a of the Federal Regulations) states, "For the privilege of mining, extracting and disposing of oil or other minerals covered by a lease under this section the lessee shall . . ." (emphasis added) Provision is also made for paying royalties on the associated minerals in the Federal oil shale leases. Thus, mining rights for other minerals associated with oil shale can be leased in combination with oil rights.

2. The second main issue is related to mineral occurrences in which sodium minerals, such as nahcolite, and aluminum minerals, such as dawsonite, are associated. Can a combined lease be issued for these under existing law and regulation? In general, there should be no problem in issuing a combined lease for nahcolite and dawsonite because the Interior Board of Land Appeals (IBLA) has ruled that dawsonite is leasable as a sodium mineral even though it also contains aluminum.

3. A potential problem area relates to the wording of Section 262 of the U.S. Code, which states that a sodium lease can be issued only if the land is "chiefly valuable" for sodium minerals. This wording also applies to several other mineral groups, such as potash. This wording could be a problem if a preference right lease applicant applied for a sodium lease but the associated oil shale was determined to be of greater value. In that case, the only type lease that could be issued would be an oil shale lease or a combined oil shale and sodium lease. The latter type of lease would probably have the most public benefit, but might preclude the lessee from developing the land at all if capital requirements for a combined lease development were too high.

The implications of the wording of these "chiefly valuable" sections should be considered. The report should include discussion of economic evaluations of multimineral deposits. The ongoing economic evaluation of a potential land exchange with the Superior Oil Company could be a model for the display of the necessary complex of information.

The most logical way to develop a specific tract is to issue a combined lease to a single lessee. This maximizes mineral recovery and decreases the potential for environmental disturbance. While this

APPENDIX I

procedure is not prohibited under current regulation, rewording of the mining laws and/or regulations would clarify multiple use policy.

Additional comments are included as an enclosure to this letter.

Sincerely,

Acting Deputy Assistant Secretary--
Policy, Budget and
Administration

Enclosure

ADDITIONAL COMMENTS

GAO Draft Report, "Aluminum in Oil Shale: Obstacles to Multiple Mineral Development on Public Lands"

** . The statement that the Mining Law of 1872 has no provision for preventing environmental damage should be changed. The Mining Law was amended by the Federal Land Policy and Management Act of 1976 (Section 302 b) to require the Secretary to take any action to prevent unnecessary or undue degradation of public lands due to operations conducted under the mining law.

** . Use of the word "dichotomies" is questioned. "Disadvantages" or "impediments" may be more nearly what is meant.

Page 1. Regarding energy considerations, it has not been experimentally demonstrated that alumina from dawsonite has an energy advantage over alternatives such as kaolin clays. It is suggested that the wording be qualified by a statement to the effect that the proponents of multiple mineral development "believe" that there are energy advantages.

Page 1. The potential of 355 billion barrels of shale oil resource in the Piceance Creek Basin is in shales averaging 30 gallons of oil per ton. There is actually a resource (including the 30 gallon shale) of 607 billion barrels of 25 gallon shale and 1.2 trillion barrels of 15 gallon shale in the Piceance Creek Basin.

Page 6. Reference is made to dawsonite and "other sodium compound minerals" as being subject to the "leasable versus locatable debate." Examples listed are bentonite, zeolite and alunite. Dawsonite, as the draft itself states, is not clearly a locatable mineral and has been classified as a sodium mineral subject to the Mineral Leasing Act of 1920 (p.). Bentonite is either a locatable or salable mineral and not leasable, and therefore not involved in this issue. Zeolite is locatable because significant amounts of sodium and potassium are lacking in its composition. Alunite is perhaps the best analogy used because there is one known location, near Patagonia, Arizona, where alunite is known to occur as a near-surface deposit overlying a deeply buried porphyry copper deposit. However, the minerals are not mingled, and separate extraction should be possible under existing laws.

Page 10. Ownership of the two prototype tracts in Utah has not been resolved. The State of Utah successfully sued the Federal Government for ownership of these tracts, and the U.S. Court of Appeals has ruled in favor of the State of Utah; however, the case is being appealed to the U.S. Supreme Court.

Page 12. The figure showing mineral leases, etc., is misleading because it lists under the category Tosco, Union, and other oil shale leases, land that is actually contained in three categories: (1) Federal oil shale lease tracts, (2) unpatented oil shale mining claims, and (3) fee land.

**Refers to material deleted from the final report

APPENDIX I

ADDITIONAL COMMENTS (Cont'd)

** . Reference to "Department" is made without identifying Interior or Energy. While Interior probably is intended, it is nonetheless somewhat ambiguous.

APPENDIX II

Department of Energy
Washington, D.C. 20545

June 1, 1979

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

We appreciate the opportunity to review and comment on the GAO draft report entitled "Aluminum In Oil Shale: Obstacles To Multiple Mineral Development On Public Lands." Our views with respect to the text of the report and recommendations are discussed below.

The draft report identifies a real and possible intractable problem of which there is no simple technological solution, as well as no simple legal and regulatory solution. Separating dawsonite from shale at the same time that it is retorted to remove kerogen is very difficult. However, the dawsonite could conceivably be removed from shale spoil piles. There is, however, no evidence that this would be economical.

Although it is unlikely that major exploitation of the oil shale resource will be undertaken soon, the present trend in petroleum prices may soon make small-scale oil from shale operations economically feasible. However, there is relatively little likelihood that the aluminum industry will need this source soon. DOE believes that the recommendations should express a greater sense of urgency with regard to the need to resolve the issue for oil shale development. Mining law revision is a tortuous process. We believe the authority may exist for testing multi-mineral operations through an interpretation of the Multi-mineral Development Act of 1954 and through effective use of land exchange authority. Although it is understandable that the Department of Interior has had to proceed slowly on the land exchange issue, it certainly appears justified and may be useful for the recommendations of this report to call for the Congress to express interest in having muti-mineral operations tested by the private sector by making land available under the 1954 Act, or through appropriate land exchanges under the Federal Land Policy and Management Act of 1976.

APPENDIX II

The GAO recommendation requires an analysis of the alternatives to be prepared by the Departments of Energy and Interior within 60 days. It is unlikely that a competent and comprehensive analysis, which should access the environmental consequences, impacts, and uncertainties of each option of this very difficult issue, could be completed in less than a year.

We appreciate your consideration of these comments in the preparation of the final report and will be pleased to provide any additional information you may desire.

Sincerely,

Donald C. Gestiehr
Director
Office of GAO Liaison

GAO RESPONSE TO AGENCY COMMENTS

Agreeing in principle with this report, the Department of the Interior objected to certain specific statements. A discussion of Interior's main objections follows:

Interior disagreed with our conclusion that current oil shale disposition policy jeopardizes future development of sodium/aluminum-rich oil shale. However, the statement (p. 10 of the main report) from which Interior feels this conclusion is drawn--that the prototype oil shale lease program did not include a tract of land with multiple-mineral development potential--was not intended as the sole support of that conclusion.

Future development of sodium/aluminum-rich oil shale is hampered by (1) the legally unresolved question of dawsonite's status--it is leasable or locatable?--and the fact that if it is locatable, legislation is needed to allow dispotition; (2) the fact that the sodium preference right leases in the heart of the Piceance Creek basin prevent development of dawsonitic oil shale by the sodium developers; and (3) the questionable inclusion of rights to sodium minerals in oil shale leases. Since neither a sodium nor an oil shale lease offers an indisputable means of disposition, future development of these intermingled minerals, particularly on the sodium lease tracts, is problematic.

Interior felt that the report should qualify statements regarding the inadequacy of leasing policy for dawsonite and nahcolite. However, the Department provided no additional information to support such a qualification. It merely identified a number of companies that might be interested in future multiple-mineral development.

Interior asserts that a Bureau of Land Management offer of a tract with multiple-mineral development potential and the land exchange with Superior Oil Company are not the only means of testing the economic benefit of alumina and shale oil co-production. As Interior points out, other land exchanges between potential oil shale developers and the Federal government are possible. However, no other companies have as yet made development proposals.

Interior felt that it was incorrect to say that dawsonite was ever eliminated from the Bureau of Mines alumina miniplant project. GAO based this statement on the fact that dawsonite was not one of the six materials selected for examination as

a candidate for demonstration plant testing, and examination of dawsonite was further postponed when the objectives of the miniplant program changed in 1975. As our report notes, dawsonite has been recently restored to the program.

Finally, Interior believes that (1) the Mineral Leasing Act of 1920 authorizes oil shale leases to include rights to other minerals, including sodium minerals, but (2) the "chiefly valuable" requirements of the leasing law and the problems of economic evaluation of multiple-mineral deposits create practical problems. This simply affirms GAO's contention that leasing tracts of land with sodium/aluminum-rich oil shale raises unanswerable questions--which of the intermingled minerals is an associated product of the other and in what combinations can they be disposed?

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